Available online on 21.02.2019 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

Open Access Research Article

Performance Analysis of Healthcare data and its Implementation on NVIDIA GPU using CUDA-C

Naseem Rao, Safdar Tanweer*

Assistant Professors, CSE Department, Hamdard University, Delhi, India

ABSTRACT

In this paper we show how commodity GPU based data mining can help classify various healthcare data in different groups faster than traditional CPU based systems. In addition such systems are cheaper than various ASIC (Application Specific Integrated Circuits) based solutions. Such faster clustering of data could provide useful insights for making successful decisions in case of emergency and outbreaks. Finally, we present conclusion based on our research done so far. In our work we used NVIDIA GPU for implementing an algorithm for healthcare data classification. Speech dissiliency and stuttering assessment can also be addressed through classification audio/speech samples using ANN, k-NN, SVM etc4. Such a faster and economical way to get such insights is of paramount importance. Specifically as a proof-of-concept we have implement k-means algorithm on health care related data set.

Keywords: NVIDIA; GPU; ECG; CPU; ANN.

Article Info: Received 11 Jan 2019; Review Completed 19 Feb 2019; Accepted 19 Feb 2019; Available online 21 Feb 2019

Cite this article as:

Rao N, Tanweer S, Performance Analysis of Healthcare data and its Implementation on NVIDIA GPU using CUDA-C, Journal of Drug Delivery and Therapeutics. 2019; 9(1-s):361-363 **DOI: http://dx.doi.org/10.22270/jddt.v9i1-s.2447**

***Address for Correspondence:**

Safdar Tanweer, Assistant Professors, CSE Department, Hamdard University, Delhi, India

INTRODUCTION

In today's healthcare practice, physicians have a need to monitor more than one medical parameter for patients that are either hospitalized or are leading their normal daily activities at home or at work place but are in need of constant medical care. Various healthcare-parameter monitoring systems have arrived in market. Such systems monitor parameters such as blood pressure, pulse rate, ECG, blood oxygen content of a person and reports the doctors about any abnormality. Such systems are very effective in big and developing countries such as India, which shares a large percentage of world population. In such demography a large scale monitoring of health is a must and traditional method may not be very effective and economical. Due to advancement in technology, especially in wireless communication area, use of mobile phones and other portable devices have become very common. Various short range technologies such as Bluetooth, IR are proving as a backbone of a number of applications in healthcare. This has given rise to Health i.e. health monitoring using portable sensors, normally worn by the patients. However, we still need to find more areas in healthcare where we can come up with effective and economical methods for patient healthcare and monitoring [1-5].

Due to advancements in portable health monitoring technology, such systems have become more and more economical & efficient. This in turn has resulted in a huge amount of data being generated every moment by millions of users of such portable devices. Such voluminous data may include audio, video, and image, and text representing blood pressure, temperature, vocal activity, ECG, sugar level etc. Medical practitioners and service providers can use such data to discover various patterns and useful insights. Such insights can be very useful on understanding various trends during epidemics, such as Malaria, Dengue, Chikungunya and other such outbreaks [6-8]. A faster and economical way to get such insights is of paramount importance. In this research we show how commodity GPU based data mining algorithms can help classify various healthcare data in different groups faster than traditional CPU based systems. In addition such systems are cheaper than various ASIC (Application Specific Integrated Circuits) based solutions. Such faster clustering of data could provide useful insights for making successful decisions in case of emergency and outbreaks [9-10].

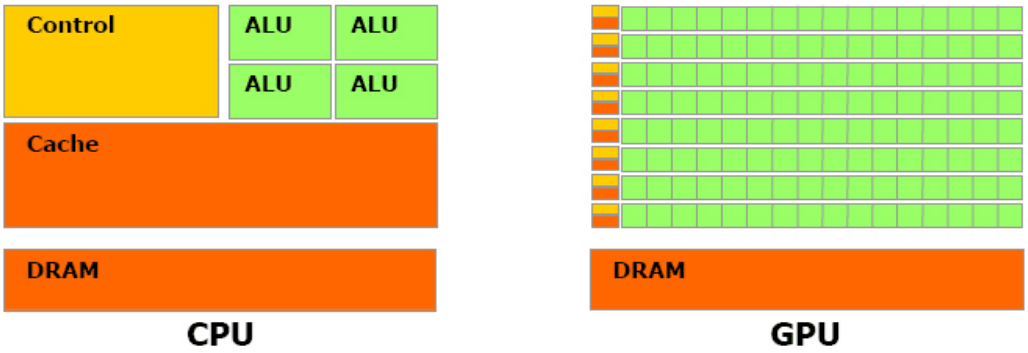

Figure 1: CPU Vs GPU

Figure 2: Chicvkanuyna patients over crowded Delhi's AIIMS [12]

DATA ANALYSIS USING CPU AND GPU

Data of is processed suing both CPU and GPU. The screen shots for output for different case are shown below:

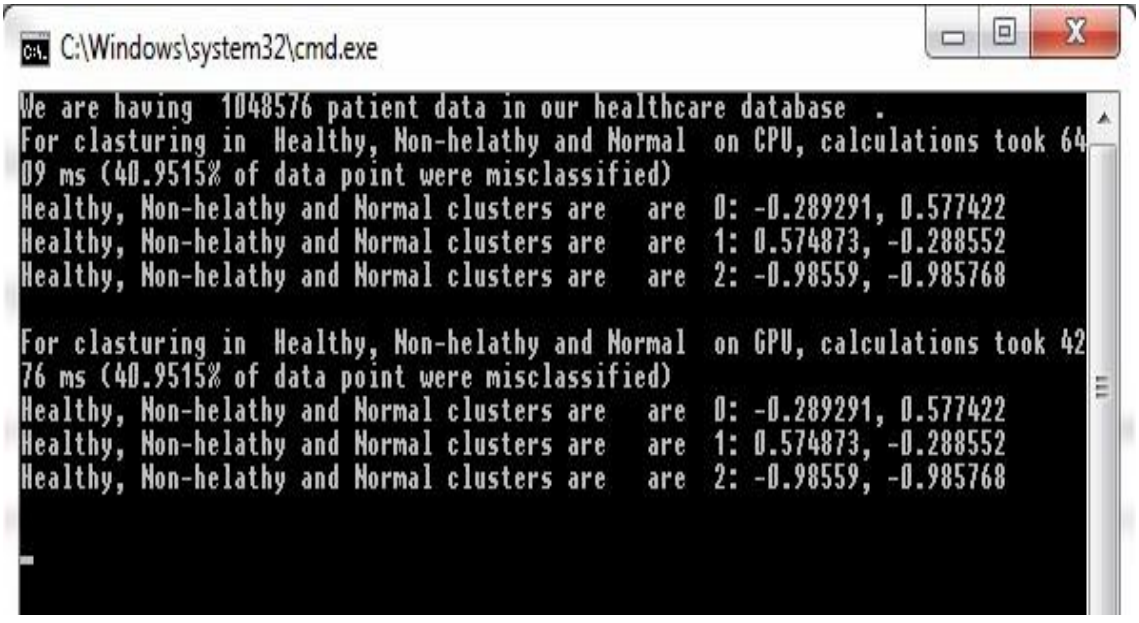

Figure 3: Output for 1024 K points

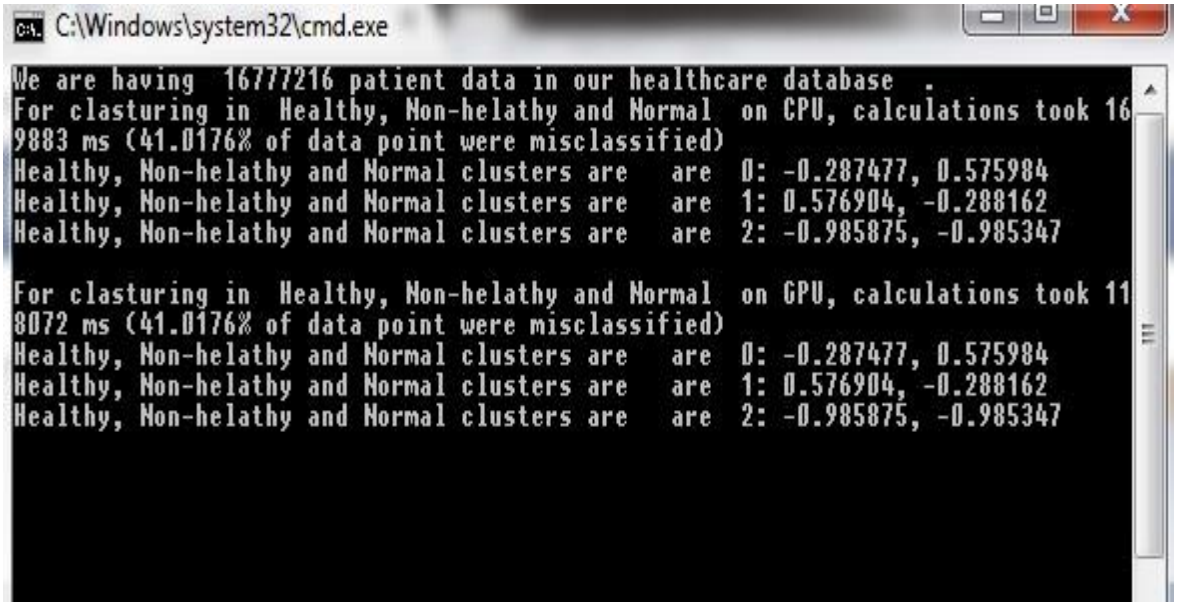

Figure 4: Output for 14364K points

The Fig 3 and 4 show how patients' data is being classified into clusters. In the first case, we are having 1048567 data set and in the second case we are having 16777216 data points. Processing of GPU is much faster than CPU. Hence, it is clear that GPU is much better than GPU for data analysis.

Table 1: Comparative Analysis of CPU and GPU [13]

CPU vs. GPU comparison

Total Vertices	Size of Adjacency Matrix	CPU time(s)	GPU time(s)	Speedup
1000	1,000,000	3.9s	0.103s	37.86x
2000	4,000,000	30.90s	0.698s	44.34x
4000	16,000,000	244.22s	5.09s	47.98x
8000	64,000,000	1941.0s	39.1s	49.64x
10000	100,000,000	3778.1s	77.8s	48.56
11111	123,454,321	5179.2s	108.01s	47.95

CONCLUSION

It is concluded that the calculations benefits from the usage of GPU. More than around 30% performance as compared to CPU is achieved in the proposed model for health study. All implementation was done on NVIDIA GPU using CUDA-C SDK. The NVIDIA GPU is a highly parallel architecture with thousands of processing cores. Each core can work in parallel resulting in several order of speed up as compared to normal CPU based serial execution. We first present an overview of NVIDIA GPUs. Then in subsequent sections we discuss algorithm and results.

REFERENCES

[1] Amna Abdullah, et.al. " REAL TIME WIRELESS HEALTH MONITORING APPLICATION USING MOBILE DEVICES". International Journal of Computer Networks & Communications (IJCNC), 2015; 7(3).

[2] DevashriS. Deshmukh, et al. ," REVIEW ON- ANDROID BASED HEALTH CARE MONITORING SYSTEM," in International Journal of Innovation in Engineering, Research and Technology 2015.

[3] Rajasekaran S, et al., "HUMAN HEALTH MONITORING USING WIRELESS SENSORS NETWORK(WSN)," in International Journal of Application or Innovation in Engineering and Management(IJMIEM) , December 2013.

[4] Mahesh Kumar D, HEALTHCARE MONITORING SYSTEM USING WIRELESS SENSOR NETWORKS," in International Journal of Advanced Networking and Applications, Apirl 2012.

[5] AlSharqi K, et al. ,"ZIGBEE BASED WEARABLE REMOTE HEALTHCARE MONITORING SYSTEM FOR ELDERLY PATIENTS," in International Journal of Wireles & Mobile Networks(IJWMN) Vol. 6, No. , June 2014.

[6] Bourouis A et al. , "UBIQUITOUS MOBILE HEALTHCARE MONITORING SYSTEM FOR ELEDERLY (UMHMSE)", International Journal of computer Science and Information Technology, 2011; 2(3):74-82.

[7] Lee Y.D., Chung W.Y."WIRELESS SENSOR NETWORK BASED WEARABLE SMART SHIRT FOR UBIQUITIOUS HEALTH AND ACTIVITY MONITORNING" Sensors and Actuators B: Chemical, 2009; 140(2):390-395.

[8] Orlando R.E.P., et al. , "AN EFFICIENT AND LOW COST WINDOWS MOBILE BSN MONITORINING SYSTEM BASED ON TINYOS" , Journal of Telecommunications Systems, 2014; 54(1):1-9.

[9] Yuce M.R, "IMPLEMENTATION OF WIRELESS BODY AREA NETWORKS FOR HEALTHCARE SYSTEMS" , Sensor and Actuators A: Physical, 2010; 162(1):116- 129.

[10] Lei Clifton, et al. , "PREDICTIVE MONITORNING OF MOBILE PATIENTS BY COMBINING CLINICAL OBSERVATIONS WITH DATA FROM WEARABLE SENSORS " , IEEE Journal of Biomedical and Health Informatics , 2014; 18(3):22-730.

[11] Hassanalieragh M et al ,"HEALTH MONITORING AND MANAGEMENT USING INTERNETOF- THINGS (IOT) SENSING WITH CLOUD-BASED PROCESSING: OPPORTUNITIES AND CHALLENGES" , IEEE International Conference on Services Computing , 2015.

[12] Picture Delhi's AIIMS: HINDUSTAN TIMES, 16 SEPTEMBER 2016.

[13] Stephen D, Boyles." USER EQUILIBRIUM AND SYSTEM OPTIMUM.", https//webspace.utexas.edu.